

# PATENT COOPERATION TREATY

# PCT

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

REC'D 06 MAY 2004



WIPO PCT

Applicant's or agent's file reference SC,044-PCT	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/PEA/416)	
International application No. PCT/GB 03/04469	International filing date ( <i>day/month/year</i> ) 16.10.2003	Priority date ( <i>day/month/year</i> ) 17.10.2002
International Patent Classification (IPC) or both national classification and IPC B07B1/46, B07B1/46		
Applicant VARCO I/P, INC. et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 5 sheets, including this cover sheet.
  - ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 12 sheets.

3. This report contains indications relating to the following items:
  - I ☒ Basis of the opinion
  - II ☐ Priority
  - III ☒ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
  - IV ☐ Lack of unity of invention
  - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
  - VI ☐ Certain documents cited
  - VII ☐ Certain defects in the international application
  - VIII ☐ Certain observations on the international application

Date of submission of the demand  26.02.2004	Date of completion of this report  05.05.2004
Name and mailing address of the international preliminary examining authority:   European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer  De Waard, W  Telephone No. +49 89 2399-2918  

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/GB 03/04469

**I. Basis of the report**

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

**Description, Pages**

1-3, 11-31 as originally filed  
4-10 received on 16.04.2004 with letter of 15.04.2004

**Claims, Numbers**

1-38 received on 16.04.2004 with letter of 15.04.2004

**Drawings, Sheets**

1/13-13/13 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).  
☐ the language of publication of the international application (under Rule 48.3(b)).  
☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.  
☐ filed together with the international application in computer readable form.  
☐ furnished subsequently to this Authority in written form.  
☐ furnished subsequently to this Authority in computer readable form.  
☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.  
☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:  
☐ the claims, Nos.:  
☐ the drawings, sheets:

**INTERNATIONAL PRELIMINARY  
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5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

**III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability**

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:

☐ the entire international application,

☒ claims Nos. 32, 33

because:

☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (specify):

☐ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. are so unclear that no meaningful opinion could be formed (*specify*):

☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.

☒ no international search report has been established for the said claims Nos. 32,33

2. A meaningful international preliminary examination cannot be carried out due to the failure of the nucleotide and/or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions:

☐ the written form has not been furnished or does not comply with the Standard.

☐ the computer readable form has not been furnished or does not comply with the Standard.

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Yes: Claims	1-38
	No: Claims	
Inventive step (IS)	Yes: Claims	
	No: Claims	1-38
Industrial applicability (IA)	Yes: Claims	1-38
	No: Claims	

2. Citations and explanations

**see separate sheet**

**Re Item III**

**Non-establishment of opinion with regard to novelty, inventive step and industrial applicability**

The international search has been made on the basis of the originally filed claims, using the description and drawings to interpret them (Article 15(3) PCT).

Since the features of claims 32 and 33 were not included in the originally filed claims but just mentioned in the description, these feature have not been searched.

Therefore, no meaningful opinion can be given with respect to inventive step of claims 32 and 34 (Rule 66.1(e) PCT).

**Re Item V**

**Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. With respect to the newly filed claims, the document US-A-3,256,992 (hereinafter referred to as D3) is considered to be of particular relevance.

D3 discloses a screen assembly for a shale shaker, the assembly comprising a screen sheet and a support structure comprising intermediate supporting ribs wherein the sheet ends of the screen sheet are deflected over said supporting ribs such that at least two spans are defined by said screen sheet (compare D3, column 3, lines 20-30 and figures 8, 9).

Thus, the gist of the claimed invention is already described in D3.

2. The subject matter of claim 1 differs from the apparatus disclosed in D3, in that a panel is provided with a multiplicity of apertures supporting the screening material and the panel further comprises a supporting rib.

However, these features are common design features already known from e.g. WO-A-00/00264 (D1) and WO-A-01/76719 (D2), compare D1, e.g. figures 10, 11 and D2, e.g. figure 1A and page 5, lines 20-23.

A skilled person may be expected to select these features additionally, in accordance with circumstances, without the exercise of inventive skill, in order to solve the problem posed.

Consequently, the subject matter of claim 1 must not be considered to involve an inventive step.

3. The same consideration holds for the independent method claim 38.
4. Independent claim 34 defines a shale shaker provided with a screen assembly according to any of claims 1-33.  
However, this is a straightforward, normal use of the claimed screen assembly in a shale shaker as known e.g. from WO-A-96/33792 (cited in the description on page 1, line 24).

Since the claimed screen assembly is not seen as inventive, its normal use is not seen as inventive either.

5. The features additionally specified in dependent claims 2-31 and 35-37 are merely straightforward possibilities from which the skilled person would select, in accordance with circumstances, without the exercise of inventive skill, in order to obtain the desired technical effect.

need not be replaced. In one aspect, the present invention attempts to provide a screen assembly to replace a known screen assembly of the pre-tensioned type.

5       The present invention also attempts to provide a panel for a screen, which will increase the life of layers of screening material arranged thereon.

10       The present invention also attempts to retain rigidity in the screen assembly, whilst being easy to replace.

15       In accordance with the present invention, there is provided a screen assembly for a shale shaker, the screen assembly comprising a panel and a support structure, the panel having an area provided with a multiplicity of apertures and at least one layer of screening material arranged over the multiplicity of apertures, wherein said panel is removable from said support structure. The layers of screening material are the most likely components of a screen assembly to fail in use. A screen assembly of the present invention allows replacement of the panel with layers of screening material attached thereto, without having to replace the entire screen assembly. It has been noted that a replaceable screen support is friendlier to the environment, as only the panel and worn layers of screening material need be sent for recycling and the screen support be reused on site.

20       Preferably, the support structure is removable from said shale shaker. Advantageously, the screen assembly is insertable into a clamping mechanism of a shale shaker. Advantageously, the panel has a perimeter, at least part of which, in use is arranged in the clamping mechanism and is pushed on to the support structure when operated.

25       Preferably, a member is arranged between the panel and the support structure within the perimeter of the

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ART 34 AMDT

panel over which the panel is deflectable. Preferably, the member is arranged substantially centrally such that the panel has at least two distinct screening areas, the at least two distinct areas have half the free span  
5 between fixing points, which in the case of the VSM 300 brand shale shaker sold by Varco limited, is between the two side rails. By reducing the span by half, the rigidity of the screen assembly can be reduced proportionally by a much greater amount. Accordingly, the  
10 screen assembly can be made much lighter, as less of the same material is required. Hence a reinforced screen panel is suitable in combination with a rigid support structure providing the support member.

Advantageously, at least one of the support  
15 structure and the panel comprises the member over which the panel is deflectable in use. Most preferably, the member is rigidly fixed support structure and/or the panel. Preferably, the support structure comprises a structural support member and the panel comprises a  
20 corresponding support member, which engage or co-operate to form a member over which the panel is deflectable in use. Advantageously, one of the structural support member and the support member has a convex rounded profile and the other has a corresponding concave rounded profile.  
25 The support member and structural support member may be formed to co-operate to allow slight movement to facilitate deflection of the panel over the support member and/or to facilitate location of the panel on to the support structure. It is important to provide means  
30 for the user to facilitate location of the panel over the support structure accurately so that downward force provided by the fixing means in the shale shaker, preferably an inflatable bladder or wedges, will properly fix the panel in the shale shaker. A interface is  
35 provided at the front end and back end of the panel,

REPLACED BY  
ART 34 AMDT

which may facilitate proper location of the panel over the support structure by abutting an adjacent screen or an interface means provided in the shale shaker. The interface may also facilitate sealing between panel to inhibit particles passing between screens and through interfaces.

Advantageously, the structural support member comprises a bar or tube extending across a substantial portion of the structural support. The structural support preferably extends along the entire length of the panel. The structural support member may comprise a square, oblong, triangular or circular section bar or tube.

Preferably, the support member comprises portions having openings therein. The openings advantageously allow fluid and small particles to flow through the openings. The openings also reduces the overall weight of the panel.

The panel may take the form of a rectangle or a circle. Preferably, the panel is rectangular having a pair of opposing sides and a pair of opposing ends, wherein the part of the perimeter is the two opposing sides.

Advantageously, the member is arranged equidistant the two opposing sides and is arranged substantially parallel to the two opposing sides. The member is arranged substantially centrally such that the panel has at least two distinct areas, the at least two distinct areas having half the free span between fixing points.

Preferably, two support members are arranged between the two opposing sides and are arranged substantially parallel to the two opposing sides. Each of the two members is preferably arranged approximately a third the way along the free span between the two sides, such that the panel has at least three distinct areas, the at least three distinct areas having a third the free span between

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ART 34 AMDT



fixing points.

Advantageously, the structural support comprises an outer frame and cross members. The outer frame and cross members are preferably made from steel tubing of square  
5 or circular cross section and are advantageously welded together at the junctures.

Preferably, the panel comprises a perforate plate, the multiplicity of apertures therein. Advantageously, the panel comprises a flat plate which may be of mild  
10 steel, aluminium or a plastics material. The apertures may be punched out, drilled, cast or cut out with a laser or saw.

Preferably, the panel comprises at least one support rib. In a rectangular screen, the ribs are arranged  
15 between sides preferably to increase rigidity across the screen, although the ribs are considerably smaller than for a screen assembly spanning the full distance between sides. The inherent rigidity of the panel must be equal or greater than the rigidity of a standard screen  
20 assembly designed to be held free between the two opposed side rails when arranged in the shaker in use, but can be much less rigid when not in use: between a third and a quarter as rigid when a single centrally mounted member is used and between a ninth and a sixteenth of the  
25 rigidity with two members arranged at approximately evenly spaced intervals across the width of the panel. Advantageously, the support rib is fixed to the perforate plate. Preferably, a multiplicity of the support ribs extend across the panel. Advantageously, the perforate  
30 plate comprises a series of panel ribs formed in the perforate plate, the support ribs aligned with and underneath the panel ribs.

Preferably, the panel comprises folded portions. Advantageously, the folded portions are perimeter  
35 portions. The folded perimeter portions may be located

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ART 34 AMDT

along the sides of a rectangular panel, which may increase the rigidity of the panel. The folded portions may be located at the ends of a rectangular panel, which may be folded to increase the rigidity of the panel and  
5 also to provide an interface between adjacent panels or to provide a holder for a seal for an interface between adjacent panels.

Advantageously, the folded portions form the apertures. The folded portions may form flanges which  
10 increase the overall rigidity of the panel, especially if all or a substantial number of the apertures are formed in this way.

Preferably, the panel has side portions, which are not provided with apertures. In a shale shaker provided  
15 with inflatable bladders or wedges as means for fixing the screen assembly in the shale shaker, the side portions are blinded by the means.

Advantageously, the at least one layer of screening material is adhered to the side portions of the perforate  
20 plate. Preferably, the at least one layer of screening material is adhered to at least a portion of the perforate plate. Advantageously, the at least one layer of screening material is adhered to the area provided with apertures. Preferably, the panel further comprises a  
25 second layer of screening material of substantially the same mesh size. Advantageously, a coarse mesh backing screen is arranged between the at least one layer of screening material and the perforate plate. The coarse mesh backing screen may have larger openings and larger  
30 wires to support the screening material.

Preferably, the support structure comprises a plurality of support ribs on which, in use the panel is pushed on to. Advantageously, the support structure has a crowned profile and the panel is pushed down over the  
35 support structure by a clamping mechanism at an outer

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ART 34 AMDT

perimeter of the panel. Preferably, the panel is semi-flexible, preferably such that the panel may change shape when a force is applied to it by the clamping mechanism of the shale shaker. The clamping mechanism may provide a  
5 tonne of force over the side edges of the screen assemblies arranged in the shale shaker, which may cover 3 to 12m over 1 to 2cm in width through a pneumatic hose. Advantageously, the panel is flexible, wherein it is easy to apply the layers of screening material to the panel  
10 and a tension in the layers of screening material is held by the panel, advantageously, such that the panel does not bend under then tension in the layers of screening material. Advantageously, wherein it is easy to transport the panel with at least one layer of screening material  
15 arranged thereon.

The present invention also provides a shale shaker comprising a screen assembly of the invention, the shale shaker comprising a basket, a vibratory mechanism and a clamping mechanism for fixing the screen assembly to the  
20 basket. Preferably, the clamping mechanism firmly fixes the panel to the support structure. Advantageously, the clamping mechanism comprises a pneumatic means. Preferably, the pneumatic means comprises a pneumatic hose. Alternatively, a hydraulic hose could be utilized  
25 and preferably, provided with an accumulator.

The present invention also provides a method for fitting a screen assembly in a shale shaker, the screen assembly comprising a panel having at least one layer of mesh arranged thereon and a support structure, the method  
30 comprising the steps of inserting the screen assembly into a clamping mechanism of a shale shaker, operating the clamping mechanism wherein at least part of a perimeter of the panel of the screen assembly is pushed down on to the support structure

35 The present invention also provides a panel for a

REPLACED BY  
ART 34 AMDT

- 10 -

screen assembly of the invention.

REPLACED BY  
ART 34 AMDT

CLAIMS

1. A screen assembly for a shale shaker, the screen assembly comprising a panel (101;301;401;500; 800) and a support structure (102;302;402;600;700), the panel  
5 (101;301;401;500;800) having an area (106;307) provided with a multiplicity of apertures (118;504) and at least one layer of screening material (400;502) arranged over the multiplicity of apertures (118;504), wherein said panel (101;301;401;500;800) is removable from said  
10 support structure (102;302;402;500;800).
2. A screen assembly as claimed in Claim 1, wherein said support structure (101;301;401;600;700) is removable from said shale shaker.
3. A screen assembly as claimed in Claim 1 or 2,  
15 wherein said screen assembly is insertable into a clamping mechanism of a shale shaker.
4. A screen assembly as claimed in Claim 3, wherein said panel (301;401;500;800) has a perimeter, at least part of which, in use is arranged in said clamping  
20 mechanism and is pushed on to said support structure when operated.
5. A screen assembly as claimed in any preceding claim, wherein a member (605;606;518;519;701;801) is arranged between said panel (500;800) and said support structure  
25 (600;700) within the perimeter of said panel (500;800) over which said panel (500;800) is deflectable.
6. A screen assembly as claimed in Claim 5, wherein at least one of said support structure (600;700) and said panel (500;800) comprises said member  
30 (605;606;518;519;701;801) over which said panel is deflectable in use.
7. A screen assembly as claimed in Claim 6, wherein said support structure (600;700) comprises a structural support member (605;606;701) and said panel (500;800)  
35 comprises a corresponding support member (518;519;801),

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ART 34 AMDT

which engage to form a member over which said panel is deflectable in use.

8. A screen assembly as claimed in 7, wherein one of said structural support member (605,606;701) and said support member (518,519;801) has a convex rounded profile and the other has a corresponding concave rounded profile.

9. A screen assembly as claimed in Claim 7 or 8, wherein said structural support member (605,606;701) comprises a bar or tube extending across a substantial portion of said structural support.

10. A screen assembly as claimed in Claim 7, 8 or 9, wherein said support member (518,519;801) comprises a portions having openings therein.

11. A screen assembly as claimed in any of Claims 5 to 10, wherein said panel is rectangular having a pair of opposing sides and a pair of opposing ends, wherein said part of said perimeter is said two opposing sides.

12. A screen assembly as claimed in Claim 11, wherein said member (605,606,518,519;701,801) is arranged equidistant said two opposing sides and is arranged substantially parallel to said two opposing sides.

13. A screen assembly as claimed in Claim 11, comprising two support members (605,606,518,519) arranged between said two opposing sides and is arranged substantially parallel to said two opposing sides.

14. A screen assembly as claimed in any preceding claim, wherein said structural support comprises an outer frame and cross members.

15. A screen assembly as claimed in any preceding claim, wherein said panel comprises a perforate plate, said multiplicity of apertures therein.

16. A screen assembly as claimed in Claim 15, wherein said panel (101;301;401) comprises a flat punched plate.

17. A screen assembly as claimed in Claim 15 or 16,

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ART 34 AMDT

wherein said panel (500) comprises at least one support rib (505).

18. A screen assembly as claimed in Claim 17, wherein said support rib (505) is fixed to said perforate plate  
5 501)

19. A screen assembly as claimed in Claim 17 or 18, comprising a multiplicity of said support ribs (505) extending across said panel (500).

20. A screen assembly as claimed in Claim 19, wherein  
10 said perforate plate (501) comprises a series of panel ribs (503a) formed in said perforate plate (501), said said support ribs (505) aligned with and underneath said panel ribs (503a).

21. A screen assembly as claimed in any preceding claim,  
15 wherein said panel (101;401;500) comprises folded portions (114-117,131-133;411,412;508,509,511,512).

22. A screen assembly as claimed in Claim 21, wherein said folded portions (114-117;411,412; 508,509,511,512) are perimeter portions.

20 23. A screen assembly as claimed in Claim 21 or 22, wherein folded portions (131-133) form said apertures.

24. A screen assembly as claimed in any preceding Claim, wherein said at least one layer of screening material (400;502) is adhered to at least a portion of said panel  
25 (101;301;401;500).

25. A screen assembly as claimed in any preceding Claim, wherein said panel (101;301;401;500) has side portions (107,108;304,305;410;508,509), which are not provided with apertures.

30 26. A screen assembly as claimed in Claim 25, wherein said at least one layer of screening material (400;502) is adhered to said side portions (107,108;304,305;410) of said panel (101;301;401).

27. A screen assembly as claimed in any preceding claim,  
35 wherein said at least one layer of screening material

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APT 34 AMDT

(400;502) is adhered to said area provided with apertures.

28. A screen assembly as claimed in any preceding claim, further comprising a second layer of screening material  
5 of substantially the same mesh size.

29. A screen assembly as claimed in any preceding claim, further comprising a coarse mesh backing screen between said at least one layer of screening material and said panel.

10 30. A screen assembly as claimed in any preceding claim, wherein said support structure (102;302;402) comprises a plurality of support ribs (202 to 213;310 to 321;406;) on which, in use the panel (101;301;401) is pushed on to.

31. A screen assembly as claimed in Claim 30, wherein  
15 said support structure (302;402) has a crowned profile and said panel is pushed down over the support structure by a clamping mechanism at an outer perimeter of the panel.

32. A screen assembly as claimed in any preceding claim,  
20 wherein said panel (101,301,401) is flexible.

33. A shale shaker comprising a screen assembly as claimed in any of Claims 1 to 32, the shale shaker further comprising a basket (413), a vibratory mechanism and a clamping mechanism (104,105;330;408,408a;654,655;  
25 754,755) for fixing the screen assembly to the basket (413).

34. A shale shaker as claimed in Claim 33, wherein said clamping mechanism (104,105;330;408,408a;654,655;754,755) firmly fixes the panel (101;301;401;500;800) to the  
30 support structure (102;302;402;600;700).

35. A shale shaker as claimed in Claim 33 or 34, wherein said clamping mechanism (104,105;330;408,408a) comprises a pneumatic means.

36. A shale shaker as claimed in Claim 35, wherein said  
35 pneumatic means comprises a pneumatic hose.

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ART 34 AMDT



37. A method for fitting a screen assembly in a shale shaker, the screen assembly comprising a panel having at least one layer of mesh arranged thereon and a support structure, the method comprising the steps of inserting  
5 the screen assembly into a clamping mechanism of a shale shaker, operating the clamping mechanism wherein at least part of a perimeter of said panel of said screen assembly is pushed down on to said support structure.
38. A panel for the screen assembly as claimed in any of  
10 claims 1 to 32.

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ART 34 AMDT